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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/880,631	06/12/2001	Wenting Tang	HP-10010812	5913

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HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, CO 80527-2400

EXAMINER

TODD, GREGORY G

ART UNIT	PAPER NUMBER
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2457

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No. 09/880,631	Applicant(s) TANG ET AL.	
Examiner GREGORY G. TODD	Art Unit 2457	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 14 May 2009.
- 2a) This action is **FINAL**.
- 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-37 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-37 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
- 5) Notice of Informal Patent Application
- 6) Other: _____.

DETAILED ACTION

Response to Amendment

1. This office action is in response to applicant's appeal brief filed, 14 May 2009, of application filed, with the above serial number, on 12 June 2001 in which no claims have been amended. Claims 1-37 are pending in the application.

In view of the Appeal Brief filed on 14 May 2009, PROSECUTION IS HEREBY REOPENED. A new ground of Rejection is set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Albert et al (hereinafter "Albert", 6,775,692) in view of Pai et al (hereinafter "Pai", Locality-

Aware Request Distribution in Cluster-based Network Servers).

Albert teaches the invention as claimed including TCP state migration and monitoring (at least Abstract).

As per Claim 1, Albert teaches in a communication network, a method of TCP state migration comprising the steps of:

a) establishing a TCP/IP communication session between a client computer and a first server computer (forwarding agent & service manager), said first server computer part of a plurality of server computers forming a web cluster containing information (at least col. 7, lines 36-60; col. 3, lines 22-57; forwarding agents connecting client / server clusters), said communication session established for the transfer of data contained within said information (at least col. 7, lines 36-60; col. 3, lines 22-57; forwarding agents connecting client / server clusters);

c) migrating a first TCP state of said first server computer to said selected server computer, and a second TCP state of said selected server computer to said first server computer over said control channel (at least Fig. 5; col. 14, lines 1-15; forwarding data packet).

Albert fails to explicitly teach b) handing off said communication session to a selected server computer from said first server computer over a persistent control

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channel using TCP handoff modules that are dynamically loadable within TCP/IP stacks in operating systems located at both said first server computer and said selected server computer, that implement a TCP handoff protocol that works within kernel levels of an existing TCP/IP protocol. However, the use and advantages for using such a system is well known to one skilled in the art at the time the invention was made as evidenced by the teachings of Pai. Pai teaches a TCP handoff protocol wherein a client establishes a connection with a front-end server, and the connection is then transparently handed to a back end server, with the handoff protocol layered on top of TCP and the subsequent connection to the back end server being forwarded by a forwarding module at the bottom of the protocol stack, for communications over HTTP persistent connections (at least Fig. 16; pp. 213 section 5-6.1). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to incorporate the use of Pai's system into Albert as this would further enhance Albert's system for use in load balancing and allowing the TCP connection to have very fast forwarding of acknowledgement packets and overall system performance increases.

As per Claim 2. Albert, along with Pai's teachings as disclosed above, teaches the method as described in Claim 1, wherein said step a) comprises the steps of:

receiving a SYN packet from said client at a first BTCP module located at said first server computer (at least col. 12 line 23 - col. 13 line 51);

sending said SYN packet upstream to a first TCP module located above said first BTCP module in a first operating system of said first server computer (at least col. 12 line 23 - col. 13 line 51);

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receiving a first SYN/ACK packet from said first TCP module (at least col. 12 line 23 - col. 13 line 51);

parsing said first initial TCP state from said first SYN/ACK packet, including a first initial sequence number for said first TCP module associated with said TCP/IP communication session (at least col. 12 line 23 - col. 13 line 51; col. 19, lines 12-15);

sending said SYN/ACK packet to said client (at least col. 12 line 23 - col. 13 line 51);

receiving an ACK packet from said client at said first BTCP module (at least col. 12 line 23 - col. 13 line 51);

sending said ACK packet to said first TCP module (at least col. 12 line 23 - col. 13 line 51);

receiving a web request packet associated with said TCP/IP communication session at said first BTCP module at said first server computer (at least col. 12 line 23 - col. 13 line 51);

storing said SYN, ACK and said web request packet at said first server computer (at least col. 12 line 23 - col. 13 line 51; col. 19, lines 12-15; TCP connection being established between the client, forwarding agent and server).

As per Claim 3. Albert, along with Pai's teachings as disclosed above, teaches the method as described in Claim 2, wherein said step b) comprises the steps of:

examining content of said web request packet (at least col. 9, lines 10-34, 45-58; service manager detailing load balancing);

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determining which of said plurality of server computers, a selected server computer, can best process said WEB request packet, based on said content (at least col. 9, lines 10-34, 45-58; service manager detailing load balancing);

sending a handoff request from said first BTCP module to a second BTCP module at said selected server computer over said control channel, if said selected server computer is not said first server computer (at least col. 14 line 65 - col. 15 line 27; SYN/ACK packets);

including said SYN packet and said ACK packet in said handoff request packet (at least col. 14 line 65 - col. 15 line 27; SYN/ACK packets);

changing a first destination IP address of said SYN packet to a second IP address of said selected server computer, at said second BTCP module (at least col. 7 line 60 - col. 8 line 11; modifying addresses in header);

sending said SYN packet to said second TCP module (at least col. 12 line 23 - col. 13 line 51);

receiving a second SYN/ACK packet at said second BTCP module (at least col. 12 line 23 - col. 13 line 51);

parsing said second initial TCP state from said second SYN/ACK packet, including a second initial sequence number, for said second TCP module, that is associated with said TCP/IP communication session; changing a second destination IP address of said ACK packet to said second IP address, at said second BTCP module (at least col. 12 line 23 - col. 13 line 51);

updating said ACK packet to reflect said second TCP state of said selected server computer in said communication session; sending said ACK packet that is updated to said second TCP module; and sending a handoff acknowledgment message to said first BTCP module (at least col. 12 line 23 - col. 13 line 51).

As per Claim 4. Albert, along with Pai's teachings as disclosed above, teaches the method as described in Claim 3, wherein step c) comprises the steps of:

monitoring traffic associated with establishing said TCP/IP communication session in step a), at said first BTCP module, to parse a first initial TCP state of said first server computer, said first initial TCP state associated with said TCP/IP communication session (at least col. 9, lines 10-34, 45-58; service manager detailing load balancing and analyzing packets for desired content); and

migrating said first initial TCP state to said second BTCP module over said control channel by including said first initial TCP state in said handoff request packet, said first initial TCP state including a first sequence number, such that said second BTCP module can calculate said first TCP state for said first server computer in said TCP/IP communication session (at least Fig. 5; col. 14, lines 1-15; forwarding data packet).

As per Claim 5. Albert, along with Pai's teachings as disclosed above, teaches the method as described in Claim 3, wherein step c) comprises the steps of:

monitoring traffic associated with handing off said TCP/IP communication session, at said second BTCP module, to parse a second initial TCP state of said selected server computer, said second initial TCP state associated with said TCP/IP

communication session (at least col. 9, lines 10-34, 45-58; service manager detailing load balancing and analyzing packets for desired content); and

migrating said second initial TCP state of said selected server computer to said first BTCP module by including said second initial TCP state in said handoff acknowledgment packet, said second initial TCP state including a second initial sequence number, such that said first BTCP module can calculate said second TCP state for said selected server computer in said TCP/IP communication session (at least Fig. 5; col. 14, lines 1-15; forwarding data packet).

As per Claim 6. Albert, along with Pai's teachings as disclosed above, teaches the method as described in Claim 2, comprising the further steps of:

intercepting a connection indication message sent from said first TCP module to an application layer above said first TCP module at a first upper-TCP (UTCP) module, said connection indication message sent by said first TCP module upon establishing said communication session (at least col. 15 line 36 - col. 16 line 15; col. 8, lines 17-25; http from client intercepted by service manager and forwarding agent); and

holding said connection indication message at said first UTCP module (at least col. 15 line 36 - col. 16 line 15; col. 8, lines 17-25).

As per Claim 7. Albert, along with Pai's teachings as disclosed above, teaches the method as described in Claim 6, wherein said method comprises the further steps of:

sending a reset packet from said first BTCP module upon receiving said handoff acknowledgment packet to said first TCP module (at least Fig. 13; col. 12 line 23 - col.

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13 line 51; col. 32, lines 46-63; TCP connection ending between the client, forwarding agent and server);

discarding said connection indication message at said first UTCP module (at least Fig. 13; col. 12 line 23 - col. 13 line 51; col. 32, lines 46-63; TCP connection ending between the client, forwarding agent and server);

receiving incoming data packets from said client at said first BTCP module (at least col. 15 line 36 - col. 16 line 15; col. 8, lines 17-25; http from client);

changing said destination addresses of said incoming data packets to said second IP address (at least col. 7 line 60 - col. 8 line 11; modifying addresses in header);

updating sequence numbers and TCP checksum in said data packets to reflect said second TCP state of said selected server computer (at least col. 12 line 23 - col. 13 line 51; col. 19, lines 12-15); and

forwarding said data packets to said selected server computer (at least Fig. 5; col. 14, lines 1-15; forwarding data packet).

As per Claim 8. Albert, along with Pai's teachings as disclosed above, teaches the method as described in Claim 6, comprising the further steps of:

sending notification from said first BTCP module to said first UTCP module to release said connection indication message, if said selected server computer is said first server computer (at least Fig. 13; col. 12 line 23 - col. 13 line 51; col. 32, lines 46-63; TCP connection ending between the client, forwarding agent and server);

sending incoming data packets, including said web request packet, from said client, received at said first BTCP module, upstream (at least Fig. 13; col. 12 line 23 - col. 13 line 51; col. 32, lines 46-63; TCP connection ending between the client, forwarding agent and server).

As per Claim 9. Albert, along with Pai's teachings as disclosed above, teaches the method as described in Claim 1, comprising the further step of:

intercepting outgoing response packets from said selected server computer at a second bottom TCP (BTCP) module located at said selected server computer (at least col. 12 line 23 - col. 13 line 51);

changing source addresses of said response packets to a first IP address of said first server computer (at least col. 7 line 60 - col. 8 line 11; modifying addresses in header);

updating sequence numbers and TCP checksum in said response packets to reflect said first TCP state of said first server computer (at least col. 12 line 23 - col. 13 line 51; col. 19, lines 12-15); and

sending said response packets to said client (at least col. 7 line 60 - col. 8 line 11; modifying addresses in header).

As per Claim 10. Albert, along with Pai's teachings as disclosed above, teaches the method as described in Claim 1, comprising the further steps of:

monitoring TCP/IP control traffic for said communication session at said second BTCP module (at least col. 32, lines 46-63; col. 8, lines 17-39; service manager monitoring packets);

understanding when said communication session is closed at said second server computer (at least col. 32, lines 46-63; col. 8, lines 17-39; connection ends);

sending a termination message to said first server computer over said control channel (at least col. 32, lines 46-63; connection ends);

terminating said TCP/IP communication session at said first server computer by terminating a forwarding mode at said first BTCP module (at least col. 32, lines 46-63; connection ends); and

freeing data resources associated with said communication session at said first server computer (at least col. 3, lines 26-56; load balancing).

Claims 11-37 do not, in substance, add or define any additional limitations over claims 1-10 and therefore are rejected for similar reasons.

Response to Arguments

4. Applicant's arguments with respect to claims 1-37 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Newly cited Tanenbaum et al and Aiken et al, in addition to previously cited Johnson et al, Lee et al, Wang, TCP Handoff, Brendel et al, Brendel, Vange et al, Soderberg et al, Aviani et al, and Colby et al are cited for disclosing pertinent information related to the claimed invention. Applicants are requested to

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consider the prior art reference for relevant teachings when responding to this office action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREGORY G. TODD whose telephone number is (571)272-4011. The examiner can normally be reached on Monday - Friday 9:00am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ario Etienne can be reached on (571)272-4001. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/G. G. T./
Examiner, Art Unit 2457

/ARIO ETIENNE/
Supervisory Patent Examiner, Art Unit 2457